Consider, for example, an example color set of six colors: aqua, black, green, violet, white, and yellow, and the following example 8x8 partitions, P1 and P2.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | B | B | A | A | A | A |
| A | B | B | B | B | A | A | A |
| A | A | B | B | B | B | A | A |
| A | A | A | W | W | W | W | W |
| A | G | G | G | G | G | G | W |
| A | A | G | G | G | G | W | W |
| A | A | Y | Y | Y | G | W | W |
| A | Y | Y | Y | Y | Y | W | W |

A=22
B=11
G=11
V=0
W=12
Y=8

P1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | B | B | A | A | A | A | W |
| B | B | B | B | A | A | A | A |
| A | B | W | W | W | A | A | A |
| A | A | W | W | W | W | W | A |
| A | G | G | G | W | W | W | A |
| A | Y | Y | Y | G | W | W | W |
| V | Y | Y | Y | Y | G | W | W |
| V | V | V | Y | Y | W | W | W |

A=18
B=8
G=5
V=4
W=20
Y=9

P2

The frequency of occurrence of each color (A, B, G, V, W, Y) is illustrated to the right of each partition. In accordance with the Applicant's claim, the characterization of each partition, P1, P2 is based on measures that are proportional to the frequency of occurrence of each color. That is, the characterization of P1 can be represented as (22, 11, 11, 0, 12, 8) corresponding to a 1:1 proportion, or (11, 10.5, 10.5, 0, 6, 4) corresponding to a 2:1 proportion, or (44, 22, 22, 0, 24, 16) corresponding to a 1:2 proportion, or (.34375, .171875, .171875, 0, .1875, .125) corresponding to a 64:1 proportion, and so on. Any characterization that does not substantially maintain the ratios among the frequencies of occurrences of the colors cannot be said to be ***proportional*** to the frequency of occurrences.

Sato, on the other hand, uses the frequency of occurrences to characterize the partition, but, to facilitate efficient storage and processing, does not retain the frequencies of occurrences, or measures that are proportional to the frequencies of occurrences. In accordance with Sato's flowchart of FIG. 44, Sato compares the frequency of occurrence of each color to a threshold value (S174). If the frequency of occurrence is above the threshold, Sato stores the ***region identifier*** in a column of an index table (S175). For the

above example, Sato's index table (FIG. 45) would contain the following entries, assuming that the threshold value is less that 8:

| | ... | BLOCK SIZE: 64 |
|---|---|---|
| COLOR:A | | P1 |
| COLOR:B | | P1 |
| COLOR:G | ... | P1 |
| COLOR:V | | |
| COLOR:W | | P1 |
| COLOR:Y | | P1 |

Note that the entry at color V is blank, because the frequency of occurrence of color V is not greater than the threshold. If the threshold value is between 8 and 10, the entry at color Y would also be blank. If the threshold value is 11, the entries at colors B and G would also be blank.

Of particular note, Sato's index table does not indicate a frequency of occurrence of the individual colors within the partition, it only indicates whether the frequency of occurrence is above or below the given threshold value. Once the partition is processed in accordance with Sato's FIG. 44 to form the index table 45, the frequency of occurrences of the colors are no longer used. That is, given the index table 45, it is ***impossible*** to determine the proportions of colors, because there are no measures in Sato's index table 45 that are proportional to the frequencies of occurrences of the colors.

The Applicant's independent claims 6 and 16, upon which claims 7-10 and 17-20 depend, address the comparison of partitions of an image, based on a comparison of the frequencies of occurrences of select sets of colors in each partition.

In the above example of partitions P1 and P2, the frequencies of occurrences of the sets of colors is (22, 11, 11, 0, 12, 8) for P1, and (18, 8, 5, 4, 20, 9) for P2. As noted in the Applicant's disclosure, any number of techniques may be used to compare these sets of frequencies of occurrences, such as a Chi-square test, a sum of square differences, and so on. Preferably, the measure is based directly on a sum of the proportions of similar colors and inversely to the difference between the proportions. In this example, the sum of the proportions for the first color, A, is 40 (22+18), and the difference is 4 (22-18). To avoid a potential division by zero, unity is added to the difference. Thus, the comparison of the frequencies of occurrence of the first color is given as 40/(1+4) = 8. In like manner, the comparison of the frequencies of occurrence of the second color, B, is given as 19/(1+3) = 4.75. Similarly, the comparison of the third color is given as 16/(1+6); the fourth color as 4/(1+4); the fifth color as 32/(1+8); and the sixth color as 17/(1+1). The total similarity measure between the partitions in a preferred embodiment is the sum of the color similarity measures, which is 27.89 in this example. Note that by basing the comparison of the images on a comparison of the frequencies, more information is obtained than a mere comparison of whether or not a color is present, or present above a given threshold, in both partitions. For example, the fact that the sixth color has approximately the same frequency in both P1 and P2 results in a high similarity measure (17/(1+1) = 8.5), whereas although the fifth color is present in both, the difference in frequencies of occurrences between the two partitions (12 and 20) results in a substantially smaller similarity measure (32/(1+8)=3.55).

As noted by the Applicant, a similarity measure that is based on frequencies of occurrences of each color in a partition conforms well with how humans perceive images. A human does not characterize an image, or part of an image, by the mere presence or absence of particular colors, but rather, by proportions of colors. For example, in describing a fabric, one would not generally say: "green, and black, and yellow"; rather, one would generally say something like, "mostly green on a black background, with some yellow". This description would be easily distinguished from another fabric that is

described as "mostly yellow with some black and green". That is, even though both items have green, black, and yellow components, a comparison of the proportion of each color (Green: "mostly" v. "green"; Black: "background" v. "some"; and Yellow: "some" v. "mostly") serves to distinguish the items.

Sato's comparisons of images are based on the index table of FIG. 45, discussed above. A subsequent characterization of partition P2 would result in the following index table, assuming a threshold of 6.

| | ... | BLOCK SIZE: 64 |
|---|---|---|
| COLOR:A | | P1 P2 |
| COLOR:B | | P1 P2 |
| COLOR:G | ... | P1 |
| COLOR:V | | |
| COLOR:W | | P1 P2 |
| COLOR:Y | | P1 P2 |

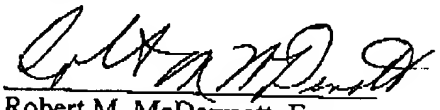
Different thresholds will provide different entries in the table, as describe above, but the significant item to note is that the proportions of each color in each partition is not contained in Sato's index, and one cannot determine from Sato's index whether partition P1 has "some" color W while partition P2 has "mostly" color W. Both P1 and P2 have entries in the index, because they both have more than a threshold amount of color W, but the index fails to capture the fact that partition P2 has almost twice the number of W colored pixels as partition P1.

In Sato's comparison, each partition having a target color (hue) is identified as a "candidate" image and region as a "primary screening operation" (Sato, column 26, lines 29-32, and column 27, lines 15-16). These candidate partitions are then subjected to a

more detailed comparison (Sato, column 27, lines 16-20). That is, Sato's indexing system is specifically designed to provide a rapid and efficient method of providing a "first pass" filtering of images to identify the image blocks that contain a specified color. Such efficiency cannot be achieved if Sato's indexing system is required to compare each frequency of occurrence of each color of a set of colors in each partition of each object in a library to the frequency of occurrence of each color of a set of colors in each partition of each object in a target image, as specifically taught and claimed by the Applicant.

Because Sato does not teach characterizing an image by measures that are ***proportional*** to the frequency of occurrences of colors in a partition, and because Sato does not teach comparing images based on the ***frequency of occurrences*** of sets of colors in each partition, as specifically claimed by the Applicant, the Applicant respectfully requests the Examiner's reconsideration of the rejection of claims 1-20 under 35 U.S.C. 102(e) as being anticipated by Sato.

Respectfully submitted,



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